Pretest 2.1 Solutions

ST Part

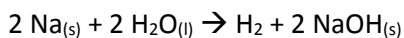1. a) What 's the only electrolyte-type that can have a pH of 7?

salt

b) Why doesn't a nonelectrolyte conduct electricity?

Such a solution does not contain ions.

c) What kind of ions will raise the pH from 3.0 to 8.0?

hydroxide ions from a base

2. An investigator goes into a lab after an explosion. Too large a piece of sodium had reacted with water:

$2\ Na_{(s)} + 2\ H_2O_{(l)} \rightarrow H_2 + 2\ NaOH_{(s)}$

a) He sees white solid on the ceiling. What test can he carry out to reveal that the substance is a base?
He could use pH paper or litmus. The latter will turn blue. Licking the ceiling to test for bitterness is not recommended.

b) What ion released by NaOH is responsible for its bitter taste?

Hydroxide (OH^-)

c) What substance can eliminate NaOH's bitterness?

Acid

d) Predict what would happen to the conductivity of aqueous sodium hydroxide if we perfectly neutralize NaOH with H_2SO_4. Explain why the solution will /won't keep conducting electricity. If so which part returns electrons?

The product will still conduct electricity because salt and water will form. The ions from the salt (Na_2SO_4)in water will allow electricity to flow through the aqueous solution. The SO42- returns electrons.

3. What two compounds will form if HBr reacts with $Ca(OH)_2$? Write a balanced equation.

$2\ HBr + Ca(OH)_2 \rightarrow CaBr_2 + 2\ H_2O$
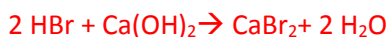
4. a) From the following list, find the most acidic substance?

    HCl

    b) How much more acidic is it compared to the next most acidic substance?

    10 times more acidic than battery acid; each pH unit is a factor of 10.

    c) Which is the most basic? NaOH

pH
0 - Hydrochloric Acid (HCl) of 1M
1.0 - Battery Acid (H_2SO_4 sulfuric acid)
2.0 - Lemon Juice
2.2 - Vinegar
3.0 - Apples
4.0 - Wine and Beer
4.5 - Tomatoes
6.6 - Milk
7.0 - Pure Water
7.2 to 7.4 - Human Blood
8.3 - Baking Soda (Sodium Bicarbonate)
10.5 - Milk of Magnesia
11.0 - Ammonia
12.4 - Lime (Calcium Hydroxide)
13.0 - Lye
14.0 - Sodium Hydroxide (NaOH)

A Flash FROM YOUR HAPPY PAST

5.   Convert 12 ppm to g/ml.

12 ppm means 12 mg/L

12 mg (g/1000 mg) = 0.012 g

1 L = 1000 mL

12 g/L = 0.012g /1000ml = 0.000012 g /ml

6.   Convert 1200 ppm of salt to (m/V)% .

1200 mg/L = 1.2 g/1000ml *100% = 0.12 %

7.   When do we use the PTA method of making a solution instead of the method involving WDTA?

Pipeting-Transfer and Adding Water is for dilution of a pre-existing solution; WDTA is for making a solution from a solid solute and water

STE PART (blue book pages 58 to 78)

1. 0.25 L of a 6 g/L solution are on the counter. How much of the solution should you dilute to 0.50 L to make a 2 g/L solution?

   $C_1V_1=C_2V_2$
   $6V_1 = 2(0.50)$
   $V_1 = 0.167$ L

2. If it took 35.25 ml of a $Ca(OH)_2$ solution to neutralize 0.98 g of H_3PO_4, what was the molarity of the alkaline solution used?

   $2\ H_3PO_{4(aq)}$ + $3\ Ca(OH)_{2\ (aq)}$ → $Ca_3(PO_4)_{2(s)}$ + $6\ H_2O_{(l)}$

   0.98 g of H_3PO_4(mole/98g) = 0.01 mole H_3PO_4

   0.01 mole H_3PO_4 (3 $Ca(OH)_{2\ (aq)}$/ 2 $H_3PO_{4(aq)}$) = 0.015 mole $Ca(OH)_{2\ (aq)}$

   C = n/V = 0.015 mole $Ca(OH)_{2\ (aq)}$/ 0.03525 L = 0.43 M

3. What is the molarity of a 3.0 L solution containing 3.0 grams of KCl?

   3.0g KCl (mole/74.5 g) = 0.0426 mole

   C = n/V = 0.0426 mole/3.0 L = 0.0142 M

4. Tomatoes have a pH of 4.5. What is the concentration of H^+ in a tomato?

   $[H^+] = 10^{-pH} = 10^{-4.5} = 3.16 \times 10^{-5}$ M

5. The LD$_{50}$ for grain alcohol is 7060 mg/kg. An 85 kg man was found dead with an empty jug of vodka next to him. If the density of grain alcohol is 0.80g/ml, and the vodka is 40% alcohol, what is the least amount of vodka that was in the jug?

7060mg/kg *85 kg = 600 100 mg = 600.1 g of alcohol
600.1 g of alcohol (ml/0.80 g) = 750.125 ml of pure alcohol'
0.40x =750.125 ml of pure alcohol
    X =1.875 L of vodka

6. If the bioconcentration factor is 120, and if we find 120 ppm of methyl mercury in a fish, what is the concentration of the toxin in the water?

1 ppm

7. a)   Place the following organisms in a food pyramid. The ppm are the parts per million of cadmium ion found in various organisms.

earthworm   0.30 ppm   fox   2.5 ppm   robin   1.0 ppm

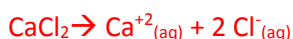roundworms   0.01 ppm

roundworms—earthworms—robin---fox

b)   How is bioaccumulation related to how you obtained your answer in a) ?

It's the reason the concentration keeps increasing up the food chain. At each level, there's a "sponge effect", which amplifies the amount of toxin in the animal.

8. Use the following solubility rules to identify the precipitate. Also complete and balance the precipitation equation.

   $K_2CO_{3(aq)} + Fe(NO_3)_{2(aq)} \rightarrow$

   2 $KNO_{3(aq)}$ + $FeCO_3\downarrow$
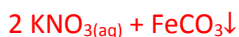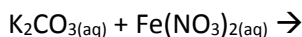
9. Complete the following ionic equation:

   $CaCl_2 \rightarrow Ca^{+2}{}_{(aq)} + 2\ Cl^-{}_{(aq)}$

10. What accounts for the fact that some electrolytes are weak even though they are ionic?

    They do not completely break up into ions.

Flashback: stoichiometry

Solubility Rules for Ionic Compounds in Water				
Anion	**+**	**Cation**	**=**	**Solubility**
Any negative ion	+	Li^+, Na^+, K^+, Rb^+, or Cs^+	=	Soluble
Any negative ion	+	Ammonium (NH_4^+)	=	Soluble
Nitrate (NO_3^-)	+	Any positive ion	=	Soluble
Acetate (CH_3COO^-)	+	Ag^+ or Hg_2^{+2}	=	Insoluble
	+	Any other positive ion	=	Soluble
Cl^-, Br^-, or I^-	+	Ag^+, Pb^{+2}, Hg_2^{+2}, or Cu^+	=	Insoluble
	+	Any other positive ion	=	Soluble
Sulfate (SO_4^{-2})	+	Ag^+, Pb^{+2}, Ca^{+2}, Sr^{+2}, Ba^{+2}, or Ra^{+2}	=	Insoluble
	+	Any other positive ion	=	Soluble
Sulfide (S^{-2})	+	Li^+, Na^+, K^+, Rb^+, Cs^+, or NH_4^+	=	Soluble
	+	Be^{+2}, Mg^{+2}, Ca^{+2}, Sr^{+2}, Ba^{+2}, or Ra^{+2}	=	Soluble
	+	Any other positive ion	=	Insoluble
Hydroxide (OH^-)	+	Li^+, Na^+, K^+, Rb^+, Cs^+, NH_4^+ or Ba^{+2}	=	Soluble
	+	Any other positive ion	=	Insoluble
PO_4^{-3}, CO_3^{-2} or SO_3^{-2}	+	Li^+, Na^+, K^+, Rb^+, Cs^+, or NH_4^+	=	Soluble
	+	Any other positive ion	=	Insoluble